Section 5
INFORMATION TECHNOLOGY ARCHITECTURE

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FEATURED IN THIS SECTION

SECTION 5

INFORMATION TECHNOLOGY ARCHITECTURE

5.1 Enterprise Architecture

This section identifies the current information technology architecture implemented in Fairfax County. The County's technology architecture is a strategic asset that defines technology components necessary to support business operations and the infrastructure required for implementation of new technologies in response to the changing needs of government business. It is a multi-layered architecture that includes:

- ➢ Application and Data Architectures
- ➢ Platform Architecture
- ➢ Network Architecture
- ➢ Internet Architecture
- ➢ Security Architecture

IT Architecture Process Model

Fairfax County adopted Enterprise Architecture (EA approach) as the blue print or roadmap by which specific technology solutions are developed. Architecture defines the manner in which technology is used to enable flexible business solutions which enable expansion and change as requirements evolve, technology is updated, or becomes obsolete. Architecture as a foundation and roadmap enables the County to establish open standards, assess the impact of new requirements and evolving technologies, and allow for the incorporation of new technologies as part of an updated blueprint that benefits other solutions. Enterprise Architecture improves the efficiency and effectiveness of technology investments by reducing redundancy, leveraging solutions and platforms, optimizing value, and promoting the sharing of knowledge and best practices across County government.
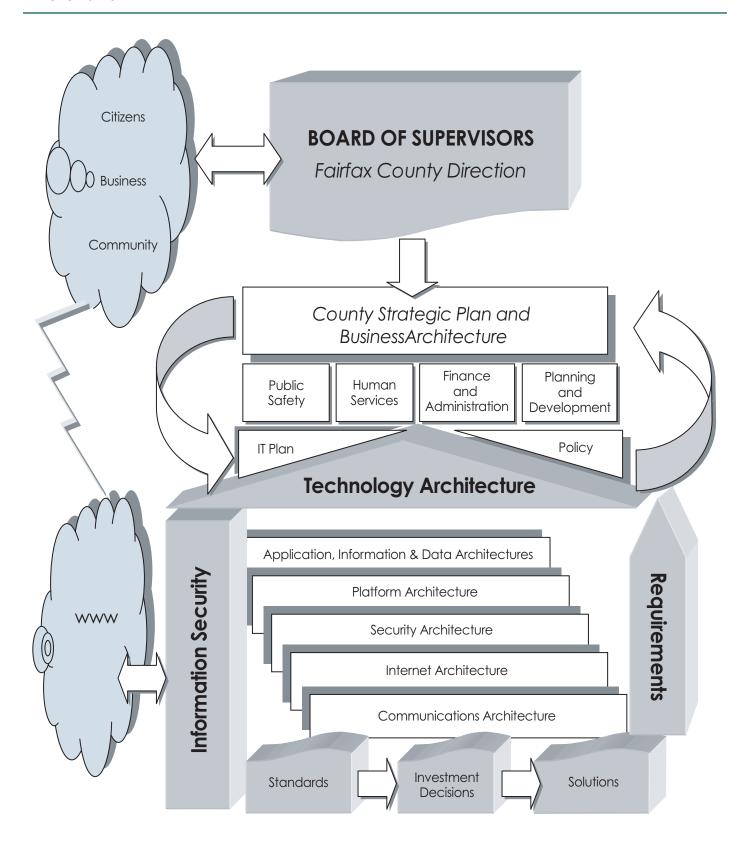
The Enterprise IT Architecture Process Model on the following page illustrates the inter-relationships between the County's IT architecture and business, and the iterative processes involved to ensure the development of an IT enterprise that is efficient, cost-effective, responsive and business driven. For the purposes of the County's model, the businesses have been grouped into four major functional areas; Human Services (HS), Public Safety (PS), Planning and Development (PD), and Finance & Revenue (F&R), inclusive of over 50 departments and agencies representing hundreds of unique and often times cross-agency services.

The model is based on the following Mission Statement that directs the County's information techology activities. Every effort undertaken is framed and aligned with this mission statement:

"Delivery of quality and innovation information technology solutions for agencies and those doing business with Fairfax County Government."

Citizens

Business

Community

BOARD OF SUPERVISORS

Fairfax County Direction

County Strategic Plan and BusinessArchitecture

Public Safety

Human Services

Finance and Administration

Planning and Development

IT Plan

Policy

Technology Architecture

Information Security

www

Application, Information & Data Architectures

Platform Architecture

Security Architecture

Internet Architecture

Communications Architecture

Requirements

Standards

Investment Decisions

Solutions

5.2 Application and Data Architecture

Application architecture defines the design and correlation among software programs and applications. The Architecture promotes common development and presentation standards, enables optimum system integration, provides opportunities for use of shared infrastructure environments, servers, storage and related tools; enables shared use of data, facilitates the reuse of components, and the rapid deployment of applications in response to changing business requirements. Application Architecture includes elements of technology architecture that converts business process to business intelligence to support the County's goal of delivering timely, efficient and cost effective services. In Fairfax County a vast inventory of enterprise-wide and agency specific applications reside on mainframe, server, and desktop computer platforms. New applications and application enhancements are constantly evaluated, developed, acquired, and implemented as older "legacy applications retire. The legacy mainframe environment will like-wise retire after all such applications have been replaced or re-developed.

The County's goal is to use and create industry standard application development tools and language environments that are adaptive in client/server and Web-enable models. Application architecture protects the County's investment in 'classic' systems by providing enhancements that facilitate enhanced user-friendliness, improved data manipulation, reporting, and end user controls. In addition, by keeping abreast of emerging technologies such as Web Services, XML, SOA and other contemporary methods, the County positions itself to take advantage of emerging opportunities offered by these technologies. An exhaustive discussion is beyond the scope of this section; however, some examples of the County's application architecture and some recent developments are described here.

As the County moves toward a balance between Commercial-Off-The-Shelf (COTS) vs. in-house development, there is a transition to a new framework for application development. The new framework incorporates Software Engineering, Information Architecture, and Application Development Methodology. These principles and techniques are used to augment the current Systems Development Life Cycle Standards (SDLCS). The resulting approach encompasses application life cycles for "cradle to grave"; that is, from the earliest stages of planning, through requirements and design, to implementation and post-implementation support. New applications will be built on the most current and promising platforms and an architectural framework based on the future of IT. While support for existing legacy systems will continue, a dramatic move is also underway to embrace new development platforms such as .Net and standards such as XML and Web Services.

The .Net platform provides the foundation for the next generation of both departmental and enterprise-wide applications and offers a stable application environment with more opportunity for componentization of business logic, sharing of common components and the integration of business processes across application boundaries. A new class of tools such as Visual Studio.Net provides County developers with a robust and flexible development environment. Encapsulating both existing and new business logic into "Web services" provide the ability to expose business processes across organizational and application boundaries, within the County, other local jurisdictions, the state, the federal government, as well as business partners. XML provides the common "glue" to hold together and provide consistent information across boundaries to facilitate data sharing among disparate platforms and systems. Enterprise Application Integration (EAI) products such as Web-Methods and Microsoft BizTalk allow virtually unlimited ability to share, incorporate information and business process from older, mainframe and client/server applications in to the new environment. With the ability to extend business processes further through the use of ASP code, the end product will be greater than the sum of the parts. A detailed "Architectural Framework" document has been developed, and is intended to be an organic document flexible enough to reflect and incorporate rapid advances in information technology.

Production Applications – Fairfax County is in the midst of overhauling and updating many of its administrative applications as well as acquiring new applications. Key applications in the midst of development or further enhancement include the County's land development system, tax systems, public safety systems, various human services systems, and financial management and human resource management systems. DIT maintains a mainfrafme environment to support County legacy applications. Efforts are underway to convert these applications to new technology. In 2010 the County's Human Resource System will be replaced with a contemporary first tier ERP solution.

DIT provides first tier infrastructure support for over 100 server-based agency applications that provide Windows GUI access to Relational Database Management Systems (RDMS). The IT standards call for complex, Internet accessible or high access databases to use Microsoft SQL Server

or Oracle as appropriate. However, there are also "fat client "and web-based agency specific applications that are maintained separately by agency IT staff. The majority of small agency applications use Microsoft Access or Microsoft SQL Server as their database and programming language architecture. Most agency server-based systems reside on Windows 2003 servers that support both applications and file and print server-sharing requirements.

Geographical Information System Applications (GIS) – The ArcGIS software suite provides high-end GIS tools and functionality to the GIS user community. The software integrates visual or graphic data in the form of maps, with descriptive or attribute information from an organization's internal databases. ArcGIS provides to tools for analysts to access, visualize, and query both graphic and tabular data for better analysis and decision-making. There are three levels of license usage for ArcGIS that the county uses. The highest level, ArcInfo, is used by professional GIS analysts for sophisticated analysis and processes. The View level is used by most users for map creating and simply analysis of the County's geographic data sets. Arc Internet Map Server (ARCIMS) and ArcGIS Server are two components used to distribute highly customized GIS based applications through the Internet / Intranet.

5.2.1 The Application Tools

Application tools are information technology components used to develop and support application functions. Application tools include the support systems required to facilitate work planning and communications.

Programming/Development Tools – New applications are currently under development using fourth generation object oriented languages and tools. This approach will continue as additional client/server applications are developed and as Commercial-Off-The-Shelf (COTS) system components are purchased. Standard life-cycle methodologies are employed to define, develop and implement new systems. The models, design, and documents created are updated throughout the system development and maintenance life cycle. In specific instances, expert system technology is used to incorporate complex rule based functionality into systems. Third and fourth generation languages and tools are used in only a few specific development efforts and as utility programs on the mainframe tier of some client/server systems. New developments use ASP and ASP.NET for the application layer. The County uses webMethods and Microsoft BizTalk to assist in the integration of applications at the presentation, business logic, and data layers. Documentum is the County's enterprise content and document management software solution. The County also supports REAMS imaging solution. Software Engineering technologies are being incorporated into the Systems Development Life Cycle Standards (SDLCS) to provide a disciplined and consistent development approach.

Collaboration Tools – The County uses Microsoft SharePoint and Office Communication Suite which include instant messaging and web conferencing. Additionally, the County uses other video conferencing and web conferencing tools to support collaborative communications.

ThinkTank is used for Group session Collaborative Software in the Group Decision Support Center. Groups use the computer-supported meeting center and its software to conduct process improvements, strategic planning, program evaluation, and vendor selection sessions.

Database Management Systems (DBMS) – The County uses several database management systems to support its business applications. Mainframe legacy applications use DB2, IDMS, and /or VSAM databases. Oracle and Microsoft SQL Server are the County's databases standards.

Departmental Reporting – Business Objects/ Crystal Reports, SAS, QMF, SQL Reporting Services are the current tools supported for basic ad-hoc query and departmental reporting.

Enterprise Decision Support Systems and Business Intelligence – The County's portfolio currently contains a number of products used for reporting, analytic, and decision support. Many of these products were brought into the environment through purchase of a variety of COTS solutions with embedded tools. As a result, the County's business intelligence capability is built on departmental level rather than an enterprise level. The proliferation of tools and the associated support, training, and infrastructure costs present a strong business case for rationalizing the portfolio. The County's strategy in this regard is to provide shared enterprise capability and infrastructure for decision support. To that end, the County is currently assessing a variety of platform solutions including SAS, Business Objects, and others that could facilitate the consolidation of isolated point solutions. As standards are defined for the County's enterprise solution(s), the portfolio will be rationalized into fewer products over time. This approach will enable DIT

to upgrade and modernized the existing portfolio while creating economies of scale for improved support and cost control.

Desktop Office Automation/Workstation Software – The County has adopted Microsoft Office Suite for general productivity automation functions including Word, Excel, PowerPoint, and Outlook. Microsoft Internet Explorer is the standard for Web browsing. Other automation software includes Microsoft Project and Visio. Agencies may have other desktop based software for special requirements.

IT Service Desk software – The IT Service Desk provides County employees a centralized portal for computer support. InfraEnterprise is the web-based solution used to support the Service Desk function leveraging the ITIL frame-

work. The Automatic Call Distribution telephone system is used to route calls. The IT Help Desk has a high percentage of first-call resolution.

5.3 Platform Architecture

Platform architecture defines the technical components of the infrastructure including server and client platforms, the operating systems and interfaces supported, as well as other software tools and equipment used to operate applications. Fairfax County's platform architecture includes over 600 servers: z/OS mainframe, UNIX (IBM AIX, Sun Solaris and Unisys ES) and Microsoft Windows 2003/ 2008. Over 12,000 PC's provide end-user access to County systems. Laptops, Blackberries and other PDAs and handheld devices also support employee access to agency

business systems. All personal computers are standardized using Windows XP /Vista and the Microsoft Office 2003/ 2007 to support office automation requirements. Vista is being rolled out in a few agencies with a careful full deployment strategy. Total server storage requirement have grown from 394 gigabytes in 1998 to the current total of over 300 terabytes. The County also uses state and other non-County hardware platforms as necessary. The following paragraphs describe the major features of the County's platform architecture.

5.3.1 The Platforms

Desktop PCs, workstations and Peripherals – DIT prescribes hardware platforms and desktop applications standards as well as procurement vehicles to optimize support and cost. Desktop computers (PCs) are replaced in accordance with the County's PC Replacement Program cycle using adopted standards bundled with the MS Suite. The PC Replacement strategy applies to all agencies and provides the County economies of scale as well as a more robust, effective support environment.

The current desktop computer platform standard consists of Pentium 4 and above processors running the Microsoft Windows XP/Vista operating system. County PCs are used for office productivity software, enterprise e-mail and groupware, application client software, Internet/Web access, and mainframe emulation. The next wave of PC replacements to be deployed will be Windows Vista. This will be approximately one-fourth of the installed base. Windows 7 and Windows Mobile will be evaluated for the next deployment enhancement.

Desktop and network printing is accomplished through a large inventory of stand-alone and network printers and appliances. Agencies use a variety of laser-jet type desktop and high speed LAN based printers in offices. In 2003, the County's copier inventory became an enterprise multi-function copier/printer/scan/fax machine asset. In FY 2005, this program was moved to the Department of Information Technology and incorporated into an enterprise printing solution strategy.

LAN-based Network Servers – Fairfax County LAN server environment utilizes Intel and Unix-based servers. Enterprise-class server technology (e.g. UniSys ES 7000, DELL/IBM Blade, SUN servers) support the County's enterprise infrastructure applications such as Exchange, Active Directory, SQL, Oracle, Citrix, etc. The County supports virtualization as a standard platform for LOB and infrastructure applications where feasible.

5.3.2 Storage Area Network

In FY 2002, Fairfax County implemented its first Storage Area Network (SAN). This enabled data storage in a centralized location, with redundancy and failover, mitigating the risk of data loss due to hardware failure. Data from all severs (mainframe, UNIX, and INTEL) now coexist on the same disk subsystem. In 2006, the County refreshed the enterprise disk arrays and fabric with EMC DMX-3 disks and Cisco fabric. The County recently enhanced storage by implementing Netapp and IBM XIV storage systems, which positions the County for future growth and the ability to meet strategic initiatives for Data Lifecycle Management.

Storage Management requirements addressed by the SAN are:

➢ Scalable storage capacity that allows users to increase storage as needed.

➢ Modular, adaptive architectures which allows users to deploy storage in a variety of centralized and distributed environments with re-deployment capabilities as needed.

➢ Highly available architectures to prevent downtime.

➢ Cross-platform solutions that support a variety of operating systems, allowing users to reduce costs by standardizing on a single enterprise storage solution, rather than operating system specific solutions.

➢ Higher levels of performance to support the ever-growing volume of online data.

➢ Higher performance backup and restore operations to support shrinking backup windows.

➢ The ability to share data across the enterprise rather than building "islands of data."

➢ Easy to use, centralized management tools that allow hardware and data to be distributed."

5.4 Network Architecture

The County's communications infrastructure includes voice and data technologies, as well as various topologies, transmission services and protocols necessary to facilitate the interconnection of server platforms, intra-building and office networks (LANs), and inter-building and campus networks (WANs). The County's voice and data networks continue to grow, in terms of cost, sophistication, and increased demand on the County's communication staff.

The Communication Group in DIT supports over 14,000 data ports and over 15,000 voice ports. While current initiatives have resulted in many significant changes future plans will continue to meet the challenge of increasing demands. The Gartner Research Group and others now document that network technologies refresh every 18-24 months. This will create additional challenges for County's fiscal and staff resources, as the County strives to keep network standards in line with evolving business requirements, security and other support needs. The communications plan strives to take into account growth, based on the needs of County agencies as programs expand, which in turn require new or expanded network resources to provide both intra and inter County links. The Internet and Web-enabled applications have rapidly expanded. This expansion and the need for business continuity required the expansion from a single high capacity DS-3 for internet services to two DS-3's and one 50-100MBPS MAN circuit connected to two separate ISPs. Initiatives and technologies, such as e-Government applications, streaming video, teleconferencing, and more integrated and complex applications drive the requirements for the County's communication infrastructure and its components, thus the requirement to update and/or enhance annually. The desire for increased network security has resulted in the County employing Network Address Translation (NAT) to add another security layer to protect its Enterprise Network.

The goal is to provide a network that is responsive and reliable for the user and the users' applications and allows for the uninterrupted flow of voice, data, and video information. To this end, the County is working on several projects that will boost and consolidate the underlying physical infrastructure supporting voice, data, and video, while providing increased, cost-effective bandwidth potential, and improved output. The best opportunity recognized is the implementation of the I-Net, a metropolitan fiber ring that connects over 400 County and Schools facilities. The County views a strong, viable communications infrastructure as a vital component in the overall IT strategy toward maintaining its success in deploying cost-effective solutions that optimizes its business goals, and maintains its reputation as a leader in technology.

Fairfax County's Enterprise Technology Operations Center

5.4.1 Enterprise Data Communications Network

The Enterprise Data Communications Network for Fairfax County Government serves as the data communications backbone that provides countywide access to information technology resources. Operated by the Department of Information Technology Infrastructure Division, the Enterprise Data Network connects approximately 14,000 computer devices in over 300 locations. These computer devices include personal computers, printers, network servers, communications equipment (routers and switches), UNIX workstations and servers, mini-computers, and the mainframe computer. Additionally, various wireless technologies are rapidly expanding throughout the County's network. The County began a project utilizing commercial broadband wireless infrastructure to support wireless applications, data, images, and live video to the field and mobile devices supporting primarily public safety responders and evolving for other key business areas.

All supported network systems are based upon open standards, and compliance with published standards is required for any network-connected device or system.

The County standard network protocol is TCP/IP. Gigabit Ethernet is the standard backbone speed in the County and 100 MBPS is the standard desktop speed.

The Enterprise Wide Area Network (WAN) is built of two different architectures. One: I-Net or Institutional Network utilizing the dark fiber provided to the County through the COX and Comcast Cable Franchise Agreements. I-Net spans seven hub sites and two key resource centers, Massey Public Safety Campus and the Government Center. These sites are networked via a 10 gigabit DWDM fiber optic backbone. The I-Net DWDM backbone provides connectivity to 180+ remote sites running a 1 gigabit uplink from the backbone to the site. I-Net also employs MPLS (Multiprotocol Label Switching)/VRF (VPN Routing & Forwarding) to allow I-Net to service many types of diverse traffic whether it is enterprise, public access, public safety, or voice over IP. Through MPLS/VRF each type of traffic can be separated logically for security support, as in enterprise vs. public access, or prioritized in the case of voice traffic. I-Net has now positioned the County Data Commu-

nications Network to respond quickly to the ever-changing technology needs of its customers. The remaining WAN sites are supported via Verizon ATM and TLS services.

The County also utilizes both ISDN and DSL technologies for small sits such as group homes and small park sites. The decision to use these technologies is based on staff size and data requirements of the staff. Use of the ISDN technology is being phased out in favor of I-Net, ATM, of DSL.

The creation of a Public Access Network in FY 2005 was an addition to the Enterprise Wide Area Network (WAN) Architecture. This network provides public access computers to the citizens of Fairfax County providing them access to County and Internet resources while protecting Fairfax County's Enterprise Network. The Public Access Network includes all public libraries, community and recreation services sites, and select human services sites. The design provides for separate physical networks at each site while sharing the existing WAN infrastructure and using logical separation on the WAN. A firewall between the Enterprise Network and Public Access Network allows for county IT staff to manage the infrastructure down to the desktop for each site. This model will be the standard for any new facilities requiring both enterprise and public access.

The County will continue to implement wireless LANs and wireless data over commercial systems as necessitated by business and operational requirements. The use of this technology is carefully evaluated to ensure all County data is protected from unauthorized access. Currently, non-broadcast SSID's, MAC address registration, and digital certificates are required to gain access to the private WLAN. VPN technology is employed to protect data over commercial services.

Network Management is currently supported on four platforms:

1. Orion Solarwinds – Monitors I-Net infrastructure for up/down alerting and performance issues.

2. Verizon Managed Services – Provides fault reporting of all ATM and I-Net sites.

Currently, mainframe connectivity is achieved through a Cisco router using CIP (Channel Interface Processor), connecting directly to the IBM Mainframe through a fiber-optic channel supporting communications of the TN3270 (Telnet) sessions. In FY 2010, the County will enable native Ethernet connectivity directly to the mainframe eliminating the need for the CIP router.

The County has implemented a "Safe" architecture dividing its perimeter into five business groups E-Commerce, Internet Access, Partners, Emergency Operations, and Public Access. Each group has its own physical firewall tailored for the specific business area. This strategy has increased firewall performance and limited exposure to each business group.

➢ The E-Commerce business group supports all public facing web services providing access to County resources for both citizen and business.

➢ The Internet business group is used to control County employee access to the internet and allow for content and virus scanning.

➢ The Partners business group allows for connections to external "Trusted Partners" to include Fairfax County Public Schools, Fairfax County Water Authority, Commonwealth of Virginia (State Police, State Health, Department of Social Services, Supreme Court of Virginia, Department of Juvenile Justice, and State Board of Elections) as well as public safety connections for several adjoining jurisdictions.

➢ The Emergency Operations group was established to secure the Emergency Operations Center providing IT resources to the Department of Emergency Operations.

➢ The Public Access network was built for the Libraries and Community and Recreation Services.

Remote access via VPN and Citrix services provides access to the County's Enterprise Network resources for telecommuters, vendors, remote access users or business travelers, as well as several small Fairfax County offices. Security for remote access is managed through a Remote Access Server using security tokens and PIN numbers.

5.4.2 Institutional Network (I-Net)

The County has designed and implemented a network (I-Net) utilizing dark fiber which was provided through the Cable Franchise Agreements with COX Communications -Northern Virginia and Comcast of Virginia.

Fairfax County's I-Net is one of the largest and most complex local government networks in operation. This carrier-class network comprised of over 4,000 km of single mode fiber (SMF), in a ring, hub and spoke topology. There are seven Hub sites that are redundantly connected in a ring. The I-Net is one of the most viable, cost-effective and technologically advanced solutions that the County has implemented since computers first appeared in the County's technology inventory. The fiber optic infrastructure enables the County enhanced capabilities for transporting data, voice and video. Through the I-Net the County will reach its ultimate goal of converged voice, data and video technologies. The I-Net can provide services such as high speed data, Voice over IP (VoIP), broadcast video, video conferencing, streaming video, and distance learning. The network has several origination points, and facilities for controlling the switching and routing of data, voice and video signals among all participating sites.

Although broadband service is available through local telecommunication companies, it comes at a significant price, a loss of flexibility, and for some services, only limited availability. The I-Net provides bandwidth that is virtually "unlimited" while meeting the County's present and future communication requirements. The I-Net is becoming the "super highway" for the County's internal video, voice and data communications. The virtually "unlimited" bandwidth provided by the I-Net allows the County to amortize its cost over the life of the I-Net with an overall long-term operating cost savings.

I-Net Voice/Data Service

See sections 5.51 and 5.53 for detailed information.

I-Net Video Network

The Video Network is a scalable integrated video transport system which provides a high quality image delivery system with scalable bandwidth, capacity, and growth potential for future Fairfax County Government and Fairfax County Public School applications. Additionally, the Video Network provides video services to over 400 Fairfax County Government and Fairfax County Public School facilities. The I-Net video network transport has two distinct communication links: Coarse Wave Division Multiplexing (CWDM) is the transport technology that provides forward and reverse transport for I-Net enabled County facilities. The forward (downstream) transport provides select cable TV operator channels and local origination content produced by the County's Video Production facilities for services such as distance learning. Each I-Net enabled facility is equipped to transmit reverse (upstream) video to the County's Video production facility for processing.

5.4.3 Voice Communications Network

The convergence of voice, data and video traffic into a single network is the ultimate goal for the County's communication architecture (see section under Network Communications and I-Net). Strategic direction for County's communications capabilities and services was developed in an FY 2002 comprehensive study of the telecommunications architecture, including support issues, unique applications and opportunities made available by the I-Net. FY 2006 saw the expansion of this strategic plan into a Request for Proposal (RFP) for the design, engineering, and implementation of a new County-wide voice platform to replace the disparate systems with an enterprise-wide voice communications solution. In FY 2007, the County began execution of a new telephone architecture with an enterprise-wide VOIP capable system. Implementation of the new voice modernization system is currently on going and will be substantially complete in FY 2010. The solution uses the latest technology that includes VOIP and the I-Net (fiber-optic network) as the backbone network that connects County facilities and will lower the County's circuit costs.

This multi-phased project spanning several fiscal cycles eliminates the diverse network of disparate legacy telephone systems with a contemporary telecommunications solution that will send call traffic over the County's I-Net infrastructure and integrate with the County's messaging platforms and IT based telephony applications. These plans and programs will help meet the telephony needs and requirements of Fairfax County citizens and employees, and leverage the high-speed, high bandwidth connectivity provided by the County's I-Net for a fully integrated video, data and telephony enterprise.

The County's Voice Communications Network provides voice communications services to all Fairfax County Government agencies, as well as various affiliates via County-owned systems located in buildings throughout the County, connected via telephone company lines and several direct County-owned connections serving various campus locations. Voice communications services are managed centrally through the network, supporting local and long-distance calling, call centers, IVR (Interactive Voice Response) systems, voice mail, conference bridge and audio-video teleconferencing, hot-lines and special '800' numbers for specific programs, industrial systems monitoring devices, and residential services for County-operated group homes and apartments. Management and voice communication support is also provided for the primary and backup '911' communications centers. In addition cell phones are centrally managed.

The total environment includes approximately 400 sites, comprised of two major campus environments, several large Human Services center, Parks, Libraries, Police, Fire and Rescue stations, "911" Centers, Public Health Centers, etc. DIT supports over 20,000 phones. During an average month the County places over 1.3 million calls excluding intra-building calls. Below is a brief, but by no means complete, summary of the current County's voice communications infrastructure.

The main Fairfax County government sites – the Massey Campus and the Government Center Campus will be served by the Avaya enterprise platform. The Massey Campus implementation was complete in FY 2008 and the Government Center Campus will be complete in FY 2010. Additionally, a number of the larger multi-agency County facilities have migrated to the Avaya platform; those that have not will be migrated by the end of FY 2010. With the implementation of a more streamlined dialing plan, many agencies with a dispersed geographic footprint are enjoying much tighter voice communications integration between locations. Avaya applications, such as the Call Center application, allow agencies to have call center agents located across the County from a physical standpoint, yet part of the same work group from a agency mission standpoint.

With its ability to leverage the cost saving technology inherent with I-Net, the new Avaya platform is able to more fully exploit the broadband capability offered by the County's fiber network. A significant share of voice communications traffic between locations is currently carried "on net" via the I-Net resulting in significant cost savings associated with not using commercial circuits.

A Nortel Networks 61C has been installed at the Health Department's Kelly Square location. This IP enabled PBX not only gave the department advanced capabilities, but it also took a significant resource load off the old Massey PBX. This system was implemented several years ago, prior to the enterprise project. Voice communications to smaller remote sites, including Libraries, Parks, Public Health Centers, etc., are served by various Toshiba systems and the newer Avaya systems.

A Nortel PBX is located at the PSCC (Public Safety Communications Center) for emergency calls, while administrative calls at this location are processed by a Nortel Succession 1000 PBX. The PSTOC building has two Nortel CS 1000 (carrier-class PBXs) installed for public safety emergency calls and a redundant 911 system. Police and Fire and Rescue stations – are on a Public Safety Voice network which is independent of the other County agencies, and have been upgraded to Nortel BCMs.

Other platforms include a ninety-six (96) port computerized conference bridge is located at the PSCC for predominately Police and Fire and Rescue operations. This conference bridge is provided by Octave, and is expandable to 192 ports; voice needs of our very small offices, i.e., small Human Services and community services sites are supported by carrier provided POTS service and single-line analog sets (some of these will be converted to IP phones off the enterprise system project). Various agencies also use centralized IVR services with connectivity provided via Verizon T-1 and numerous channel banks at distant sites. These services have greatly improved Fairfax County Government's ability to provide quality services to its citizens and business clientele.

The County's voice communication systems that used to capture ACD historical statistics have been replaced with new hardware and a new Call Center Management solution from Avaya as part of the Voice Modernization Project. This capability greatly improves the collection of necessary statistics used by Call Center managers to evaluate the County's response to County citizens. Additionally, the County has implemented a new Telecommunications Expense Management System – Anchor Point which significantly improves the management of the County's telephony systems and improves inventory, work order, and billing processes.

Mobile Data Network – To support operations of the various public safety agencies, the County operates a 450NHZ mobile data communications system (MDCS) that ties the response vehicles of the Police, Fire and Rescue and Sheriff's departments to the County's Computer-Aided Dispatch

(CAD) system, as well as access to various databases maintained by the Commonwealth of Virginia and the Federal Bureau of Investigation. This system consists of more than 900 Mobile computers Terminals (MCT) and Vehicular Radio Modems (VRM) in vehicles of the various agencies, with transmitting equipment located at six sits in the County.

Public Service Radio Network – The County operates a second 800 MHz trunked radio system that supports more than 3,000 radios for the Department of Public works and Environmental Services, Public Schools Transportation (school buses), Park authority, FASTRAN, the CONNECTOR bus system, and other non-public safety County agencies. In 2005, this seven-site system replaced a 1980s era system that had limited coverage and performance. Continuing in FY 2010, the County will remain fully involved in the FCC mandated 800 MHz re-banding effort.

5.5 Internet Architecture

Fairfax County's Internet architecture supports the County's E-Government program which utilizes emerging technologies to make County services and information more readily accessible and available to the public. The interactive nature of technology allows the public to conduct business (e.g., pay taxes, apply for permits, etc.) with the County at their convenience and provides convenient access to enterprise data (real estate assessments, Human Services resource databases, etc). The e-Government architecture defines the standards, technologies and guidelines for public access, and requirements for conducting electronic business with County agencies, state agencies and outside entities. The County's Internet architecture is comprised of the following:

> **High Speed Connection to the Internet –** The County's fractional DS-3 connections to the Internet provide internet access for County staff as well as outside access to the County's Web server(s) by residents, business, and others via the Internet.

> **Public Access Web Server –** The County's Public Access Web Server provides Internet users with a vast amount of information made available by various agencies within the County. The Web server can be viewed as an "on-line service counter" where residents and others may obtain information related to services, licenses, taxes, recreation, court filings, etc. The Web server also acts as the distribution or collection point for information obtained from or provided to enterprise databases via an "Application Server".

> **Intranet Web Server –** The County InfoWeb Intranet Web server provides a portal access to County information and applications for agency and employee use.

➤ **Application Servers –** provide the gateway between the County Web servers and the information stored in County enterprise databases. The application servers communicate with various databases on the County mainframe and other platforms, accessing and collecting the requested information, formatting the information, updating the database where appropriate, and returning the result to the Web server for dissemination to the requestor. Application severs also provide additional levels of security to ensure that only allowable information is accessible.

➤ **Interfaces –** between the County Application servers and the enterprise databases provide the link that allows access to data residing in a wide array of sources. The interfaces make it possible to access data from virtually all of the County databases: DB2, Oracle, SQL, MS Access and VSAM. The interfaces are comprised of "Application Program Interfaces" (APIs), Open Database Connectivity (ODBC), SOA, and other standards that enable the access layer of the web architecture.

5.6 Security Architecture

The Information Security Office defines the security standards and policies necessary to protect the information assets of the County. The security layer employs security principles coupled with a hardware and software infrastructure supported with application policies, plans and procedures. This architecture is designed to provide an appropriate level of protection for all County information processing resources regardless of platform and includes incorporation of industry best practices for overall reduction of risk.   Security continues to be a fundamental component of the County's e-business strategy. Fairfax County's secure network architecture takes a greater defense-in-depth approach to network security design. A method of network partitioning and the development of a modular infrastructure are deployed to better shield important resources within the network. This modularity controls the traffic that flows to and from one area of the network to any other.

The objectives of the information security program are to ensure confidentiality of information, integrity of data, systems and operations, technical compliance for HIPAA and PCI, privacy and availability of information processing resources. The information security program utilizes a multifaceted approach to meet these objectives that includes research and implementation of threat reduction techniques, technological and managerial solutions when possible as well as implementation of awareness raising activities. The basic elements of identification and authentication, access control and monitoring of information processing activities are employed throughout the enterprise.

In view of the dynamic environment of information technology, the security architecture continues to evolve to meet the challenges arising with new technologies necessary to conduct e-government activities. Identification and authentication, access control, and auditing functions are performed on the specific platforms using the capabilities inherent in the appropriate operating system. Policies, standards, software, hardware and processes are continually evaluated in order to modernize the infrastructure and facilitate the County's e-government activities while providing secure access to County resources. Fairfax County has implemented a network architecture that takes a greater defense-in-depth approach to network security design.

Firewall technology is used as the main perimeter defense with all access from the Internet routed through the County's system of firewalls. In addition, the County uses broad filtering and routing at the firewall portion nearest to the Internet connectivity, while more granular filtering and routing is exercised nearest the internal network connection. Classic authentication for each internal user is based upon a unique UserID (also called a sign-or log-on) combined with a unique password. To improve the secure access and authentication to web-based applications as well as backend servers, the County has procured products to provide a solution that resolves today's security issues and positions DIT to leverage this investment and framework in the future. E-Trust, through its SiteMider module, provides a software platform of shared services that includes reduced sign-on, authentication management (who are you), and entitlement management (what you are allowed to do on the site) for web-based applications. eTrust also provides a secure reverse proxy solution that passes requests to enterprise backend content servers, and returns resources to the requesting client, thus allowing for a practical solution to the protection of internal assets. With Identity Management in place, the County will be in a position to manage user profiles for both internal staff and public access, making personalized e-Government a reality. Expansion of eTrust will continue in order to provide a secure access and an end-user authentication platform for internal and external users.

The County's network employs a private/public network model. Sensitive and critical assets are located on the private portion of the network while information and services available for public use are located on the public section. DIT continues implementation of modularized, multiple firewalls supporting a variety of specialized application requirements. The County provides Dial-Up, VPN and Web Access technologies for remote users. Each of these requires security tokens and LDAP authentication for access. Remote access is approved at the same level as if the user were physically at their work site. Remote access is granted to authorized telecommuters, who periodically need to access County Systems from home or other locations. The remote access program has proved of further strategic value as it has been expanded to accommodate continuity of operations planning for Fairfax County.

The County has implemented an Intrusion Detection System (IDS) to detect intrusions within the network and is implementing an Intrusion prevention System (IPS). IPS differs from IDS in that its primary function is prevention rather than detection. IPS devices can proactively prevent intrusions by detecting signs of an intrusion and/or detecting an actual intrusion attempt. IPS provides capacity to perform real-time analysis of Intrusion attempts to determine if sensitive data, systems or network devices are being attacked or if a breach of confidentiality, integrity, or availability has occurred. The primary objective of Intrusion Prevention is to reduce damage and isolate/contain malicious traffic. With the large quantities of lag and alarm data generated by firewalls and sensors, the need for a specialized application to support the role of correlation was implemented. The IPS solution conducts a comprehensive threat assessment and allows for quick identification of credible threats to the organization in order to facilitate expedited response and containment of intrusions and malicious activity.

As mandates such as HIPAA and Procurement Card Industry standards become effective, the consequences of employees mishandling sensitive and confidential data have changed with new enforcement ramification. Information security awareness activities are implemented to effect a culture change for all employees. Through security conscious employees, realization of return on investment in security technologies can be leveraged further as overall risk to data and systems is reduced.

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